

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) An etching apparatus functioning to process a wafer having a surface on which a patterned mask for etching is formed, in a plasma etching process chamber and trim-treat said mask under etching action by plasma so as to reduce the width of said patterned mask, said apparatus comprising:

a plasma monitor for measuring an amount of radicals in said plasma process chamber; and

trimming condition calculating means for calculating a condition required for trimming treatment to obtain a desired mask width on the basis of a precedently measured width dimension of said patterned mask and a precedently measured amount of edge perimeter undulation of mask sidewalls of the mask, as well as the amount of radicals measured by said plasma monitor,

wherein the trimming treatment is carried out for the trimming condition calculated by said trimming condition calculating means;

wherein the edge perimeter undulation amount is calculated on the basis of:
an aspect ratio of a mask edge perimeter undulation portion; or, and ~~wherein the edge perimeter undulation amount is calculated on the basis of a Fourier frequency of the shape of a mask edge perimeter undulation portion.~~

2. (Original) An etching apparatus according to claim 1, wherein continuously to said trimming treatment, a treatment of etching said wafer is performed in said plasma etching process chamber.

3.-4. (Cancelled)

5. (Original) An etching apparatus according to claim 1, wherein an optical emission spectrometer is used as said plasma monitor.

6. (Original) An etching apparatus according to claim 1, wherein said required condition is a time required for the trimming treatment.

7. – 9. (Canceled)

10. (Currently Amended) An etching apparatus functioning to process a wafer having a surface on which a patterned mask for etching is formed, in a plasma etching process chamber and trim-treat said mask under etching action by plasma so as to reduce the width of said patterned mask to a target width, said apparatus comprising:

a plasma monitor for measuring an amount of radicals and amount of ions in said plasma process chamber; and

trimming condition calculating means for calculating a condition required for said trimming treatment to obtain a desired mask width on the basis of a precedently measured width dimension of said patterned mask and a precedently measured

amount of edge perimeter undulation along vertical mask sidewalls, as well as the amount of radicals and the amount of ions measured by said plasma monitor,

wherein the trimming treatment is carried out for the trimming condition

calculated by said trimming condition calculating means;

wherein the edge perimeter undulation amount is calculated on the basis of:
an aspect ratio of a mask edge perimeter undulation portion; or, a Fourier frequency
of the shape of a mask edge perimeter undulation portion.

11. (Previously Presented) An etching apparatus according to claim 10, wherein continuously to said trimming treatment, a treatment of etching said wafer is performed in said plasma etching process chamber.

12.-13. (Cancelled)

14. (Previously Presented) An etching apparatus according to claim 10, wherein an optical emission spectrometer is used as said plasma monitor.

15. (Previously Presented) An etching apparatus according to claim 10, wherein said required condition is a time required for the trimming treatment.

16. (Previously Presented) An etching apparatus according to claim 1, wherein said plasma monitor measures an amount of ions and the amount of radicals during the trimming treatment, and said trimming condition calculating

means determines an ending time of the trimming on the basis of the measured amount of radicals and the measured amount of ions.

17. (Previously Presented) An etching apparatus according to claim 10, wherein said plasma monitor measures an amount of ions and the amount of radicals during the trimming treatment, and said trimming condition calculating means determines an ending time of the trimming on the basis of the measured amount of radicals and the measured amount of ions.

18. (Currently Amended) An etching apparatus functioning to process a wafer having a surface on which a patterned mask for etching is formed, in a plasma etching process chamber, and trim-treat said mask under etching action by plasma so as to reduce a width of said patterned mask to a target width, said apparatus comprising:

a plasma monitor for measuring an amount of radicals and amount of ions in said plasma process chamber; and

trimming condition calculating means for automatically calculating a trimming condition including trimming timing required for said trimming treatment to obtain a desired mask width by taking into consideration a pre-measured width dimension of said patterned mask and a pre-measured amount of line edge perimeter corrugation extending along vertical mask sidewalls, as well as the amount of radicals and the amount of ions measured by said plasma monitor, wherein the line edge perimeter of the vertical mask sidewalls has corrugation consisting of alternating ridges and grooves, and wherein the amount of line edge perimeter corrugation is defined as a

protrusion amount of ones of the ridges of the line edge divided by a protrusion width of the ones of the ridges of the line edge;

wherein the trimming treatment is carried out for the trimming condition including the trimming timing, calculated by said trimming condition calculating means;

wherein the edge perimeter undulation amount is calculated on the basis of: an aspect ratio of a mask edge perimeter undulation portion; or, a Fourier frequency of the shape of a mask edge perimeter undulation portion.

19. (Previously Presented) An etching apparatus according to claim 18, wherein the trimming condition calculating means automatically calculating the trimming condition including both a line edge perimeter corrugation trimming time and a mask proper trimming time, wherein the line edge perimeter corrugation trimming time is directed to lessening the amount of the line edge perimeter corrugation of the patterned mask, and the mask proper trimming time is directed to lessening a width of a major body of the patterned mask; and

wherein the trimming treatment is carried out for the trimming condition including the line edge perimeter corrugation trimming time and the mask proper trimming time, calculated by said trimming condition calculating means.

20. (Previously Presented) An etching apparatus according to claim 18, wherein continuously to said trimming treatment, a treatment of etching said wafer is performed in said plasma etching process chamber.

21.-22. (Cancelled)

23. (Previously Presented) An etching apparatus according to claim 18, wherein an optical emission spectrometer is used as said plasma monitor.

24. (Previously Presented) An etching apparatus according to claim 18, wherein said required condition is a time required for the trimming treatment.

25. (Previously Presented) An etching apparatus according to claim 18, wherein said plasma monitor measures an amount of ions and the amount of radicals during the trimming treatment, and said trimming condition calculating means determines an ending time of the trimming on the basis of the measured amount of radicals and the measured amount of ions.